lie in synclines, for reasons which the writer hopes to demonstrate in a later paper.

Most of the high-grade ores bear from 45 to 52 per cent of manganese, but many otherwise good deposits bear too much phosphorous to justify exploiting them. "Hand-picked" ore is the highest grade. The ore is not used for chemical purposes, but is employed in various high-manganese iron and steel products; it is also of importance in making brown, gray, and speckled bricks, when mixed with clay.

The manganese reserves probably amount to 250,000 tons of 40 per cent manganese. The deposits are covered to the south by younger formations, and could probably not be extensively worked in that direction anyway, since concentration and oxidation have not been extensive under the heavy capping.

C. H. B., JR.

Magnesite Deposits of Grenville District, Argenteuil County, Quebec. By M. E. WILSON. Memoir 98, Canadian Geological Survey, Ottawa, 1917. Pp. 88, figs. 2, pls. 11, maps 3.

This district is bordered by the Ottawa River on the south and is about halfway between Ottawa and Montreal. The magnesite deposits are about ten miles north of the Ottawa River.

Chapter i gives information of general interest about magnesite, its uses, foreign source of supply, other Canadian magnesite deposits, and the history of magnesite mining in Grenville district.

Chapter ii is a brief statement of the geology of the district. The oldest rocks belong to the Grenville sedimentary series and are intruded by pyroxene-rich gabbro, diorite, and syenite belonging to the Buckingham series. These two series are intruded by batholithic masses of granite-syenite gneiss. All these rocks are intensely metamorphosed and are Early pre-Cambrian in age. These Early pre-Cambrian rocks are intruded by diabase dikes and a stocklike mass of granite-syenite probably of Late pre-Cambrian age. The Paleozoic is represented by the Potsdam, Beekmantoan and Chazy formations named in ascending order. Glacial bowlder clay and gravel and Champlain marine clay form an irregular mantle over the bed-rock surface.

Chapter iii gives a description of the magnesite deposits and their origin. The magnesite is associated with serpentine, dolomite and other minerals in the metamorphosed Grenville sediments and close to outcrops of the pyroxenic rocks of the Buckingham series. The deposits are lens-shaped and the material is banded, the banding being due to

differences in color of the magnesite or from variations of amounts of serpentine and other minerals present. The strike of the bands and lenses is parallel to that of the Grenville sediments. The deposits have been intensely faulted and crumpled and probably the lenticular structure is the result of deformation. The mode of occurrence of the following minerals associated with the deposits is described: magnesite, serpentine, dolomite, diopside, phlogopite, quartz, talc, pyrite, sphalerite, magnetite, and graphite.

The three methods of origin for magnesite deposits are: (1) deposits formed by the decomposition of serpentine, (2) sedimentary deposits, (3) deposits formed by the replacement of limestone. The Grenville deposits are thought to have been formed by the replacement of limestone. Silication of limestone to diopside and phlogopite is very common along the contacts of limestone and igneous rocks in this region and the igneous rocks are very close to these particular deposits. The writer summarizes the method of origin: "The probable order of events by which the magnesite deposits of the Grenville district were formed was as follows: (1) silication of the limestone to diopside and the formation of phlogopite in places, (2) formation of serpentine in places, (3) replacement of limestone by dolomite, (4) replacement of dolomite by magnesite, and (5) the alteration of diopside to serpentine."

Chapter iv is a detailed description of the properties and gives tabulated descriptions of many magnesite samples with the percentage of CaO. While dolomite and magnesite are very intimately intermingled, yet by 1916 development work had proved the presence of 686,900 tons of magnesite containing less than 12 per cent CaO and 483,700 tons containing over 12 per cent CaO.

Map 1680 issued in 1919 shows in detail the geology of a portion of the township surrounding the deposits.

J. F. W.

Pleistocene Marine Submergence of the Hudson, Champlain and St. Lawrence Valleys. By HERMAN L. FAIRCHILD. New York State Museum Bulletins, Nos. 209, 210, Albany, N.Y., 1919. Pp. 76, pls. 25.

This is the closing paper by Professor Fairchild on the glacial and post-glacial waters of New York State and in it he discusses the proof and extent of the marine submergence following the retreat of Wisconsin glacial ice from northern New York State. The stratified clay and